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ABSTRACT

This review analyzes literaure dealing with applications of management information system (MIS) tools to educational management. Of the three levels of management--operational control, management control, and strategic planning-- the literature suggests that most activity is taking place at the operational control level. Fewest applications have been attempted in srategic planning. A 47-item bibliography of related literature is included. (RA)

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MANAGEMENT INFORMATION SYSTEMS

Analysis of Literature and Selected Bibliography

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FOREWORD

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The bibliographies and analyses were required by USOE's National Center for Educational Research and Development (formerly the Bureau of Research) in planning its new program of directed research and development. School organization and administration is one of four areas of education chosen by the center to receive concentrated research and development assistance. The others are reading, early childhood, and vocational education.

Through a joint effort the Clearinghouse staff completed the bibliographies and analyses for shipment to USOE by July 2, the deadline date.

The analysis and bibliography combined here focus on (1) educational management information systems in existence or under development, and (2) evidence on state requirements for such systems.

The literature cited in the bibliography and analyzed in the paper was drawn from a search of the two ERIC index catalogs, Research in Education and Current Index to Journals in Education, and from the following non-ERIC sources: Books in Print, Cumulative Book Index, Education Index, Public Affairs Information Service, Sociological Abstracts, Social Sciences and Humanities Index, and Book Review Digest. Although the urgency of the request precluded a full and comprehensive search and analysis of the literature, the reviews and bibliographies are intended to assess accurately some of the current developments and emerging trends on the topic.

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Philip K. Piele
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Analysis of Literature on

MANAGEMENT INFORMATION SYSTEMS

The educational administrator considering application of management information system (MIS) tools in his educational system experiences many problems that were faced by military and industrial managers who have applied these tools over the past two decades (Bushnell 1964, Bushnell and Allen 1967, Goodlad and others 1966, and Loughary 1966). The developing trend of MIS applications in education is quite similar to the past trend in industry.

Anthony (1965) specified three main levels of management: operational control, management control, and strategic planning. A large segment of the literature suggests that most activity is taking place at the operational control level, where problems tend to be more easily defined, less complex, and more easily structurable. Significant penetration has also occurred at the management control level, but only a few applications have been attempted at the strategic planning level. (Potential applications of MIS to educational planning are described by Cook 1966 and by McIsaac and others 1969.)

At all levels, most applications of MIS are still in the developmental stage. Examples of present educational management information systems in existence

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Note: This paper was adapted largely from "Educational Management Information Systems: Progress and Prospectives," by John A. Evans, part 5 of Social and Technological Change: Implications for Education, (see bibliography).

or under development are provided in reports by Coffin (1968 a and b), Goodlad and others (1966), Kromer (1969), Peirce and others (1967), South Carolina State Department of Education (1969), and Zwickel and others (1966 a, b, c, and d).

Evans (in press) delineated six management functions--needs assessment, resource management, logistics, planning, operational control, and evaluation. The literature noted above indicates that most MIS applications in education provide assistance in resource management and operational control. Here again the greatest number of applications have been developed for those managerial functions where problems are least complex and most structured. The other four functions, which appear to remain virtually untouched by MIS, are the ones that bear the greatest need of these techniques.

Applications in these areas have been retarded for several reasons. Besides their complexity, which adds to the difficulty of defining problems, the decisions associated with these managerial functions often require data that are either unavailable or too costly for any one school district to collect and maintain (Grant 1967). Included in the literature on the problem of data availability are (1) discussions of future information requirements and data needs for educational MIS (Loughary and Tondow 1967 and Mowery 1969a), (2) models for determining essential data needs (Sparks and others 1965 and Whittenburg and Schumacher 1969), and (3) reports of investigations designed to specify data requirements for implementation of MIS in education (Hoshovsky 1969, Lamkin 1966, Lewis 1967, Perkins 1969, and Sims 1969).

However, the most fundamental reason why these functions are not being

computer-aided lies outside technology: Effective needs assessment, planning, and evaluation can only be undertaken after goals and objectives have been clearly identified (Goodlad and others 1966).

Evans (in press) listed four major limitations that have confronted the development of MIS applications. These limitations, highly interrelated in their effects, are (1) the state of the art in data management software, (2) data and model availability, (3) problem definition, and (4) educational management team involvement.

The software required for an MIS application can be characterized by the number of files that need to be maintained and the speed with which these files need to be updated to provide relevant information. The complexity of data management problems is directly proportional to the number of files and the speed of the updating required by the application.

Even if an MIS application can be easily accommodated by present software capabilities, it faces limitations in availability of necessary data and relevant models. Applications at the operational control level quite frequently deal only with internal (or local) data generated during daily transactions (Bagley 1967). At the strategic planning level, however, the job (e.g., student enrollment forecasting) may require acquisition of data developed externally or tools, such as simulation models, to aid the planning and evaluation of alternatives concerned with future time periods. High costs and risks will be incurred to the extent that a job requires past external data rapidly, because data acquisition is dependent on the availability of MIS networks either not yet developed or not yet reasonably priced. Extremely high risk situations are those that require

the use of external data covering future projections and for which simulation and forecasting aids are currently only under development and/or not as yet operationally relevant.

The ability to define the problem is determined by how simple or complex and structured or unstructured the problem is. Simple problems involve few variables and few interrelationships among the variables. Complex problems involve many variables with a large number of interrelationships. Structured problems are those whose dimensions and variables, and the cause and effect relationships among these variables, are well known. Unstructured problems, on the other hand, have opposite characteristics, requiring the analyst to exercise a great deal of judgment in devising solution strategies.

An example of a simple, structured set of problems, which basic MIS techniques are currently able to define and solve, is simple accounting functions. Some capability exists for handling problems in student counseling and inventory control, which may be described as simple but unstructured in nature. There is also some MIS capability for defining and solving problems such as student scheduling and budget planning--problems that are complex but structured. Currently there is poor capability for solving problems, like K-12 curriculum planning and organizational renewal, that are complex and u unstructured. (These examples are provided by Evans and Likert forthcoming.) As we ascend the management hierarchy into the middle and upper levels, problems become more complex and less structured, which accounts for the limited application of MIS at those levels.

The largest risks and costs in terms of misspent financial resources,

wasted management time and effort, and unnecessary MIS tool development will surely be incurred if educational managers at all levels are not substantively involved in leading the effort to reshape and renew the educational system. (For a report of an MIS training program for California educational administrators, see Operation PEP 1967.) Goodlad and others (1966) fear that inadequate involvement of educational managers will lead to the misapplication of MIS tools as happened in industry and the military in the 1950s and 1960s. Decisions on what information should be collected through costly MIS networks must be made by the accountable educational management team. Additional decisions, fast increasing in significance, concern the design and choice of a computer-based MIS system. These decisions have many subtle consequences related to the redistribution of power and knowledge throughout the school system and the community, and thus require strong leadership by educational management.

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